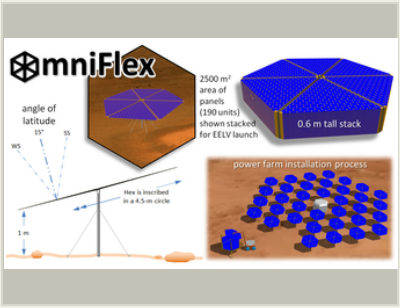
OmniFlex - Modular Power for Mars Surface Missions, Phase I

Completed Technology Project (2017 - 2017)

Project Introduction

NASA has a need to deploy an aggregate PV area of 2500 m2 on Mars - a very large area comparable to more than 60 of the largest wings ever deployed in GEO. Heritage large space (0-g) deployables are not applicable on Mars, as they require offloaders. If smaller deployables were used, the number of deployables and mechanisms grows exponentially, as does cost, and mass when sized for 0.4-g and aeolian loads. A robot-erected, power farm from modular components is much more practical, and can have greater performance than any 0-g solar array. The proposed innovation, OmniFlex, a solar array without any deployment mechanism, can be thought of as a pre-deployed UltraFlex that has been perfectly optimized for large area landed PV farm installations. OmniFlex panels are very simple and low cost: Each is a pre-built hexagonal platform composed of a thin composite ribs emanating from a central hub, to which is bonded ultra-light flexible blankets composed of high efficiency PV bonded to a gossamer fabric scrim. The rib design allow stacking at a low (3.3-mm) pitch, enabling 190 panels to stack for launch at only 0.65 m high. OmniFlex is like Ikea for planetary power: Compactly shipped, easily erected, and cost effective. And yet performance is extraordinary, even with respect to the challenging subtopic goals. The technology is extremely light (>300 W/kg) and stacks hyper-efficiently (>100 kW/m3) for transport to Mars. The deployment of the power field will be by pick and place robotics, using modular OmniFlex units. The proposal details and demonstrates the practicality and performance of this approach for construction of a huge array farm on Mars (or the moon, or in-space). Individual units can be re-purposed on rovers, habitats, comm stations, etc. And with viable in-space assembly tech emerging, the potential for OmniFlex panels to be tiled onto robotically-assembled MW-scale truss structures looks extremely promising as an adjunct application.



OmniFlex - Modular Power for Mars Surface Missions, Phase I Briefing Chart Image

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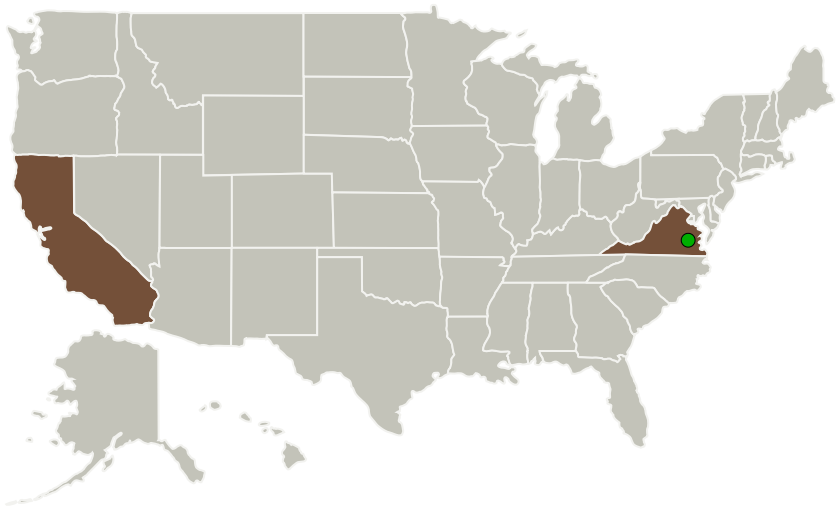
Primary U.S. Work Locations and Key Partners



Organizations Performing Work	Role	Type	Location
Angstrom Designs, Inc.	Lead Organization	Industry	Santa Barbara, California
Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations	
California	Virginia

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Angstrom Designs, Inc.

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

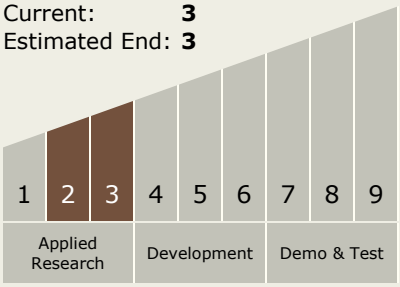
Carlos Torrez

Principal Investigator:

Casey P Hare

Technology Maturity (TRL)

Start: **2**
Current: **3**
Estimated End: **3**



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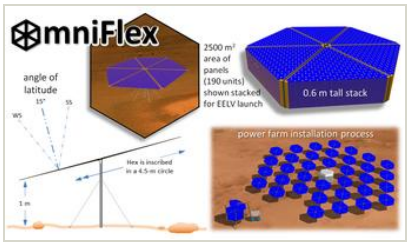
Images



Briefing Chart Image
OmniFlex - Modular Power for Mars Surface Missions, Phase I Briefing Chart Image
(https://techport.nasa.gov/image/133878)

Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
  - TX12.2 Structures
    - TX12.2.1 Lightweight Concepts

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System